ROYAL ASTRONOMICAL SOCIETY.

VOL. XII. *December* 12, 1851. No. 2.*

J. C. ADAMS, Esq., President, in the Chair.

W. S. Bohn, Esq., York Street, Covent Garden; and
J. J. Waterstone, Esq., of Bombay,
were balloted for and duly elected Fellows of the Society.

Extract of a Letter from Professor Challis, dated Jan. 10, 1852.

"I have been at considerable pains to get at the truth about the supposed new planet, and last night I believe I succeeded. The object observed by Dr. De Gasparis, Dec. 8 and 9, must have been *Japetus*. By a rough calculation I find that the place of this satellite at that time, and its change of position relative to *Saturn*, sufficiently accord with the observations. This is the only satellite whose right ascension could differ as much as 30^s from that of *Saturn*. Although Dr. De Gasparis states that he took account of *Japetus*, I conceive that he must have mistaken *Titan* for *Japetus*, or perhaps some other object was supposed to be *Japetus*. M. Rümker's place is, I conceive, an observation of *Titan*. I ascertained this last night, having found *Titan* in the same position relative to *Saturn* which the object observed by M. Rümker had on Dec. 24; and the interval between Jan. 9 and Dec. 24 (16 days) is very nearly *Titan's* periodic time. I have seldom, perhaps never, seen the satellites of *Saturn* so bright as they now appear; and I am not surprised that *Titan* should be taken for one of the asteroids. It is a good 9th magnitude, and was visible, notwithstanding its proximity to *Saturn*, in the finder of our telescope."

VICTORIA.

DURHAM. Fraunhofer Equatoreal. (Mr. R. C. Carrington.)

1851.	Green. M.T. h m s	R.A. h m s	N.P.D. ° ′ ″	No. of Comps. in R.A.	No. of Comps. in N.P.D.	Set.
Nov. 4	12 48 54·8	8 14 18·22	77 16 3·0	8	4	1
18	12 29 48·7	18 8·23	78 23 28·0	12	5	2
22	13 39 29·8	8 18 20·51	78 40 54·4	24	8	3

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* This *Notice* contains all the papers received up to the date of going to press. The January Number will consist of the purely *astronomical* phenomena observed during the solar eclipse of 1851, July 22.

1851.	Green. M.T. h m s	R.A. h m s	N.P.D. ° ′ ″	No. of Comps. in R.A.	N.P.D.	Set.
Nov. 24	13 0 43·3	8 18 17·84	78 48 54·8	22	8	4
27	13 15 18·5	18 1·07	79 0 30·7	24	8	5
28	13 17 56·1	17 52·40	79 4 12·6	23	8	6
Dec. 21	13 2 12·5	7 14·09	80 2 5·4	24	8	7
22	11 28 0·2	8 6 31·25	80 3 14·8	24	8	8
	12 11 16·4	29·45	19·5	24	8	9

Parallax taken from the Supplement to the *Nautical Almanac*, 1854.

Assumed *Mean* Places of Stars of Comparison, 1851·0.

Name.	R.A. h m s	N.P.D. ° ′ ″	Set.
Weisse, viii^{h}, 381	8 14 55·90	77 20 22·8	1
— viii^{h}, 488	18 39·63	78 29 28·2	2
B.A.C. 2806	15 45·95	78 53 30·0	3, 4, 5, 6
Weisse, viii^{h}, 96	4 46·53	79 58 44·0	7, 8
— viii^{h}, 189	8 8 9·14	80 8 26·1	9

Sets 1, 2. Planet excessively faint, 12th magnitude. Great difficulty in observing it at all.

— 3 to 6. B.A.C. 2806 taken from Edinburgh Observations, 1837.

5 and 7. Sky foggy on these two nights.

LIVERPOOL. Equatoreal. (Mr. Hartnup.)

1852.	Green. M.T. h m s	R.A. h m s	N.P.D. ° ′ ″	Comp^{n}—Obs^{n} R.A. s	N.P.D. ″	Star of Comp.
Jan. 17	10 47 18·1	7 41 26·35	79 54 35·2	−4·19	−15·9	B.A.C. 2636
18	11 29 8·8	7 40 21·57	79 52 51·3	4·24	18·4	— —
	11 44 6·4	20·97	46·1	4·29	14·3	— —
	11 59 3·2	20·14	44·7	4·11	14·0	— —
20	11 34 9·5	7 38 16·19	79 49 7·9	4·28	16·7	— —
	11 52 5·9	15·27	7·0	4·14	17·1	— —
	12 10 2·5	14·42	4·5	4·07	16·1	— —
23	10 49 22·8	7 35 13·05	79 43 66·3	4·17	18·4	— —
	11 17 19·3	11·82	62·6	4·12	17·3	— —
	11 37 15·3	10·86	59·9	−4·00	−16·4	— —

The observations are corrected for refraction and parallax. The computed places were deduced from the ephemeris circulated by the Superintendent of the *Nautical Almanac*.

The following assumed *mean* place of the star of comparison for Jan. 0·1852, has been derived from various modern catalogues.

	R.A. h m s	N.P.D. ° ′ ″
B.A.C. 2636	7 47 28·80	80 44 53·3

PARTHENOPE.

DURHAM. Fraunhofer Equatoreal. (Mr. R. C. Carrington.)

1851.	Green. M.T. h m s	R.A. h m s	Exc. of Ephem. s	N.P.D. ° ′ ″	Exc. of Ephem. ″	No. of Comps. in R.A.	N.P.D.	Set.
Aug. 28	12 17 15·4	2 19 22·56	+4·84	82 28 44·7	−26·9	18	6	1
30	12 15 51·3	19 55·39	4·49	32 18·0	28·2	12	4	2
Sept. 5	12 52 12·1	20 49·66	5·83	46 35·5	29·2	15	5	3
6	13 45 55·8	20 52·51	6·08	49 35·8	30·0	15	5	4
9	13 22 22·1	20 50·34	6·30	82 58 57·0	23·0	24	8	5
11	13 0 37·6	20 39·95	6·43	83 6 1·2	27·9	18	6	6
13	13 36 23·1	20 21·76	6·77	13 43·1	28·8	15	5	7
21	14 35 22·1	17 56·70	7·57	83 49 15·9	25·6	9	3	8
27	14 34 29·4	14 55·21	8·07	84 20 17·5	21·2	24	8	9
28	15 13 57·8	14 18·37	8·11	25 55·1	21·0	15	5	10
Oct. 4	14 32 55·2	10 14·70	8·09	84 59 52·1	21·5	8	3	11
11	14 11 17·0	4 36·07	8·31	85 40 47·9	21·0	24	8	12
	14 44 31·6	34·65	8·53	58·6	23·5	24	8	13
13	10 36 6·1	2 59·64	7·80	85 51 31·8	17·9	24	8	14
	11 14 49·3	57·69	8·32	45·0	21·8	24	8	15
	12 0 39·6	56·34	7·99	54·2	19·8	24	8	16
15	12 19 55·7	1 7·83	8·43	86 3 27·9	17·7	24	8	17
16	10 13 54·1	2 0 18·19	8·40	8 38·0	16·2	24	8	18
	11 11 46·9	16·19	8·20	53·4	18·0	18	6	19
19	12 7 47·1	1 57 28·73	7·91	25 47·7	17·3	12	4	20
23	10 32 58·8	53 49·60	7·59	86 46 33·0	16·8	24	8	21
26	9 36 3·6	51 5·49	7·49	87 1 1·7	13·4	24	8	22
	10 21 15·8	3·81	7·44	8·4	11·2	24	8	23
27	10 12 36·1	50 10·03	6·69	5 47·3	12·6	24	8	24
28	10 24 16·1	49 15·33	6·54	10 19·5	11·7	24	8	25
31	9 21 26·9	46 37·13	7·21	22 45·6	8·6	8	4	26
Nov. 2	10 5 34·6	44 52·71	7·01	30 35·2	11·3	24	8	27
3	8 54 25·9	44 4·85	7·06	33 59·0	10·9	24	8	28
4	10 46 30·6	43 12·01	6·70	37 39·9	11·5	21	7	29
12	10 36 2·4	37 18·20	5·83	58 8·0	7·1	24	8	30
13	11 27 48·4	36 37·92	6·03	87 59 55·4	8·5	24	8	31
18	9 29 18·3	33 49·14	5·64	88 5 23·8	9·3	16	8	32
22	12 16 5·7	31 56·33	5·60	6 14·4	9·7	15	5	33
24	8 4 41·9	31 15·44	5·30	5 32·1	10·5	24	8	34
	11 35 8·9	12·42	5·27	22·8	6·4	16	8	35
25	11 55 19·7	30 52·19	5·28	4 40·1	6·7	9	3	36
27	8 48 33·9	30 19·37	5·39	2 49·1	6·8	21	7	37
	10 18 43·1	18·41	5·36	48·8	10·9	24	8	38
28	10 32 29·6	30 3·52	5·17	88 1 28·1	7·7	24	8	39
Dec. 22	8 43 54·8	1 32 20·91	+5·30	86 39 55·1	−21·9	24	8	40

Parallax and computed places taken from Luther and Vogel's ephemeris given in the *Astron. Nachrichten*, No. 773.

The interpolations have been performed by second differences for the Greenwich time of observation, increased by the longitude of Berlin and diminished by the aberration-time; it having been inferred that the ephemeris gives *true* and not *apparent* positions.

Assumed *Mean* Places of Stars of Comparison, 1851·0.

Name.	R.A. h m s	N.P.D. ° ′ ″	Set.
Weisse, ii^h, 347	2 21 5·13*	82 17 25·4	1
— ii^h, 158	10 48·40*	30 35·9	2
— ii^h, 417	25 5·00*	82 46 25·4	3, 4
— ii^h, 309	19 1·19	83 2 56·7	5
B.A.C. 789	27 11·15	10 48·5	6, 7
— 793	27 55·05*	83 49 34·5	8
Anonym. 8th mag.	18 25·45*	84 22 43·0	9
Weisse, ii^h, 312	19 13·64*	84 26 36·7	10
— ii^h, 112	8 0·01	85 2 42·6	11
B.A.C. 687	5 42·48*	41 7·7	12
Weisse, ii^h, 27	3 9·03	37 16·1	13
— ii^h, 35	3 48·36	56 11·2	14
— ii^h, 102	7 12·41	49 40·5	15
— ii^h, 72	5 29·88	56 59·8	16
— ii^h, 51	4 14·39	6 42·3	17, 18
— ii^h, 78	5 57·94	9 56·4	19
B.A.C. 663	2 1 54·49	28 30·8	20
Weisse, i^h, 984	1 54 57·88	86 52 24·7	21
— i^h, 892	50 16·23	87 3 28·5	22
— i^h, 962	53 55·35*	2 11·7	23
— i^h, 860	47 54·06	9 14·0	24, 25
— i^h, 847	47 4·52*	20 24·2	26
B.A.C. 574	45 50·70	87 33 0·0	27, 28, 29
Weisse, i^h, 703	38 50·20	88 2 45·6	30
— i^h, 620	34 11·72*	3 5·5	31 to 34, 38
— i^h, 511	30 38·82*	10 26·3	35
— i^h, 489	28 12·41	88 1 52·7	36, 37, 39
— i^h, 540	1 31 14·25	86 38 9·7	40

Those stars which have an asterisk following their right ascension have been observed three times each on the meridian at Durham in right ascension. The corrections to the *Naut. Alm.* stars used at Greenwich have been applied in finding clock-errors. The north polar distances have not been corrected.

Set 1. Planet a good 10th magnitude.

— 4. Comparisons, from some cause, not very regular.

— 6 and 7. Star's place adopted from Rümker and Henderson.

— 8. B.A.C. 793. Right ascension observed on the meridian. North polar distance corrected approximately by equatoreal comparisons with four neighbouring stars in Weisse. This star appears to have a proper motion of about

$+2''\cdot2$ in R.A., and $-1''\cdot8$ in N.P.D.

Set 9. Star's north polar distance depends on that of Weisse, ii^h, 312.

— 11. Sky most changeable.

— 12. B.A.C. 687 appears to be 1^s in error in right ascension in catalogue.

— 20. Unfavourable night. Star's place taken from the Edinburgh Observations for 1837.

— 21. Unfavourable night. Foggy. Measures affected.

— 24. Objects furry. Atmosphere loaded.

— 26. Measures interrupted by haze coming on.

— 27. Excellent night. Star's place adopted from the Greenwich and Edinburgh Observations.

— 30. Star's north polar distance increased by 5″ after comparison with Weisse, i^h, 620.

— 35. Weisse, i^h, 511 requires 1^m to be added to its right ascension.

— 40. Star's north polar distance seems suspicious. Two unforeseen interruptions and unusually bad weather have prevented my examining this star and obtaining more observations during December.

PALLAS.

DURHAM. Fraunhofer Equatoreal. (Mr. R. C. Carrington.)

1851.	Green. M.T. h m s	R.A. h m s	Exc. of Ephem. s	N.P.D. ° ′ ″	Exc. of Ephem. ″	No. of Comps. in R.A.	No. of Comps. in N.P.D.
Oct. 26	13 14 34·5	3 40 45·44	−1·59	114 6 13·9	−27·1	10	5
27	13 2 49·3	3 40 9·11	−1·77	114 22 43·7	−27·4	24	8

Parallax and computed places taken from the *Nautical Almanac*, 1851.

Star for both nights, B.A.C. 1191, taken from the Greenwich Twelve-year Catalogue.

	R.A. h m s	N.P.D. ° ′ ″
1851·0	3 41 15·12	114 20 23·4

The measures on the 26th were unfavourably taken, the planet being near the edge of a cloud. On the 27th well seen.

Extract of a Letter from Professor Argelander.

"I have not been able to find time as yet to complete my memoir on Flamsteed's Observations, my Southern Zones having hitherto occupied me exclusively. A large portion of this work is, however, prepared, and the printing has proceeded as far as the tenth sheet. I hope to complete it before the end of this year. To bring it earlier into the hands of astronomers, I purpose to divide it into three parts; but I can even now furnish star-positions from the MSS. The following places of the stars of comparisons, which

were used at Cambridge, Durham, and Hamburg, for *Irene* and *Eunomia*, will, I hope, give still greater accuracy to those excellent observations."

Mean Places for 1850 of Stars compared with *Eunomia*.

		Argel. Zone.	No.	Mag.	R.A. h m s	Decl. ° ′ ″
Cambridge	*b*	220	74	6	17 53 39·58	−24 16 29·9
—	–	222	57	7	39·77	30·7
—	*c*	220	80	7	17 55 58·43	−24 23 61·9
—	–	222	63	7.8	58·85	59·3
Hamburg	1	220	88	9	18 0 28·45	−24 43 60·6
—	–	222	71	9	28·45	59·1
—	5	220	95	9	18 4 21·34	−24 37 36·0
—	–	222	75	9	21·26	35·0
—	7	220	98	9	18 5 22·60	−24 36 8·5
Cambridge	*d*	220	101	8	18 7 24·33	−23 56 36·7
—	–	222	79	8	24·44	37·2
—	*e*	220	112	7.8	18 12 57·15	−22 59 5·8
Durham	3	224	63	7.8	57·47	5·5
Cambridge	*a*	222	84	7	18 12 17·43	−24 58 36·0
Hamburg	11	308	37	6	17·56	33·1
Durham	1, 2	222	90	8.9	18 16 2·62	−23 3 14·4
—	4	224	76	9	18 23 28·27	−22 23 37·3

Mean Places for 1850 of Stars compared with *Irene*.

		Arg. Zone.	No.	Mag.	R.A. h m s	Decl. ° ′ ″
Durham	*d*	297	32	7.8	15 28 7·22	−16 30 36·8
—	*e*	207	95	7	15 30 10·50	−17 10 3·7
—	–	297	36	7.8	10·17	2·4
—	*b*	205	48	7.8	15 34 20·50	−15 31 43·4
—	–	297	40	7	20·43	38·0
—	*c*	297	41	7.8	15 35 27·17	−16 23 20·5
Hamburg	1	207	105	8	15 38 45·91	−17 37 9·6
—	–	303	82	8.9	45·73	11·3
—	2	303	85	6.7	15 41 17·78	−17 26 19·7
Durham	*f*	207	110	7.8	15 41 18·11	−17 40 43·0
—	–	303	84	7.8	18·17	44·2
—	*g*	385	120	7	15 54 24·63	−19 25 5·0
—	*l*	386	116	8	16 15 28·94	−22 18 0·3
—	*m*	213	41	7.8	16 29 20·50	−22 34 60·1
—	–	382	32	8	20·21	58·7
—	–	386	33	7.8	20·82	57·1
—	*n*	213	43	8.9	16 32 12·13	−23 1 38·5
—	–	286	35	8.9	12·24	34·9

ENCKE'S COMET.

LIVERPOOL. Equatoreal. (Mr. Hartnup.)

1852.	Green. M.T. h m s	R.A. h m s	N.P.D. ° ′ ″	Comp^{d}—Obs^{d}. R.A. s	N.P.D. ″	Star of Comp.
Jan. 11	7 14 17·4	23 4 6·86	86 2 3·0	−0·48	+6·3	B.A.C. 8105
16	6 58 32·2	23 10 1·69	85 34 60·7	·81	−4·3	— 8177
	7 18 30·4	2·68	57·3	·75	5·8	— —
	7 38 28·4	3·38	56·8	·40	10·3	— —
17	6 49 52·9	23 11 16·11	85 28 62·5	·24	2·4	— —
	7 9 52·0	17·85	63·7	·90	8·7	— —
	7 29 50·6	18·91	57·6	·89	7·8	— —
25	6 41 15·3	23 22 11·10	84 35 33·3	·17	3·9	— 8233
	7 11 13·7	13·41	21·7	·63	1·5	— —
	7 33 12·3	14·63	22·4	−0·51	−8·9	— —

The observations are corrected for refraction and parallax. The computed places were deduced from the ephemeris circulated by the Superintendent of the *Nautical Almanac*.

The following are the assumed *mean* places of the stars of comparison for Jan. 0·1852.

	R.A. h m s	N.P.D. ° ′ ″	Authority.
B.A.C. 8105	23 9 29·58	87 31 31·9	Greenwich 12-years' Catalogue.
8177	23 20 27·71	84 26 0·0	— — —
8233	23 32 20·40	85 10 30·9	Greenwich Observations, 1849

The observation on the 11th was obtained during a very brief interval between clouds. The appearance of the comet was that of a faint patch of nebulous light of between 1′ and 2′ diameter. Notwithstanding its proximity to the moon on the 25th, it was very much brighter on that day than it was on the 11th.

MARKREE. Large Equatoreal. (Mr. Graham.)

	G.M.T. 1852.	R.A. h m s	Decl. ° ′ ″		
Jan.	17·30475	23 11 17·83	+4 31 26·2	10	*a*, *b*
	20·29675	23 15 11·68	+4 50 18·7	10	*c*

			R.A. h m s	Decl. ° ′ ″
a	B.A.C.	8127	23 12 46·59	+4 34 19·5
b	Weisse, xxiii,	252	23 12 36·59	4 30 14·3
c	Lalande,	45753	23 14 29·43	+4 41 35·8

The comet's places have been corrected for parallax, not for aberration.

These give for the correction of the *Nautical Almanac* places,

	s	″
Jan. 17	+0·28	+18·0
20	+0·31	+19·5

"On the 17th a third star of comparison was noted, but the place deduced from it,

h m s	° ′ ″
23 11 16·95	4 31 24·6

turned out to be nearly one second of time different in right ascen-

sion from those obtained by comparison with the other two stars, when I used Bessel's determination of the former, viz.,

	1852·0	h m s	° ′ ″
Weisse, xxiii, 229		23 11 17·70	4 36 8·7

"This circumstance would have been puzzling had there been no other authority for the star; but, fortunately, it occurs both in Lalande and Piazzi as follows:—

	1852·0	h m s	° ′ ″
Lalande, 45638		23 11 16·57	4 36 14·3
Piazzi, xxiii, 43		16·20	13·0

"There can be little doubt, therefore, that the star has a secular proper motion in right ascension of upwards of two seconds. I assumed, in the comparison, that the places given by Mr. Stratford in his ephemeris are *apparent*. At the time of the observation on the 17th, there was an impression that whatever little condensation of light existed was not central, but north-east of the centre. I cannot say, however, that this was confirmed on the 20th. On the latter occasion there were small stars in the coma, and I feared there were others in the brighter parts; the agreement of the observations leads me to hope such was not the case. Last night cleared up, but not early enough to see the comet."

Mr. Graham got observations of Encke's Comet on the 23d and 24th inst., and states that the proximity of a ninth-magnitude star troubled him very much; its light weakened that of the comet considerably. He adds that he never before had been so much impressed with the vapoury nature of such bodies, and that one could readily imagine that the comet of Encke could be compressed into the compass of a nutshell.

D'ARREST'S COMET,

With different Ring-Micrometers applied to the 5-foot Fraunhofer.

BONN. (Professor Argelander.)

1851.	Bonn M.T. h m s	R.A. ° ′ ″	Decl. ° ′ ″
July 3	13 13 2·3	14 31 33·6	+10 47 3·0
5	13 37 41·9	16 42 41·2	49 3·1
6	13 21 9·8	17 46 6·6	49 20·0
22	12 26 54·0	33 43 35·7	+10 4 42·9
24	13 11 48·5	35 33 50·4	+ 9 53 7·5
25	12 50 52·8	36 26 20·2	47 1·4
27	13 5 36·6	38 11 3·8	33 36·2
28	12 46 56·2	39 1 27·5	+ 9 26 24·4
Aug. 2	12 42 6·5	43 5 45·5	+ 8 46 50·4
5	12 55 41·5	45 23 35·5	20 7·2
	13 25 0·4	84·3	8·3
7	13 32 49·8	46 52 23·3	+ 8 1 12·2

1851.	Bonn M.T. h m s	R.A. ° ′ ″	Decl. ° ′ ″
Aug. 21	13 41 25·3	55 39 42·6	+ 5 29 5·0
22	13 14 40·7	56 10 28·2	+ 5 16 52·6
25	13 34 4·4	57 40 53·9	+ 4 39 33·5
Sept. 2	13 29 41·8	61 4 36·0	+ 2 55 56·9
24	12 57 31·4	65 49 64·2	— 2 8 56·7
	13 9 36·8	38·0	53·9
27	12 32 9·6	65 57 18·9	— 2 49 58·0
	13 42 55·7	0·4	109·6
Oct. 2	13 17 59·8	65 52 57·4	— 3 57 9·7
3	14 6 14·8	65 49 52·4	— 4 10 31·0
	14 37 43·3	44·5	28·8
4	13 45 1·1	65 45 38·4	— 4 22 58·2

The following observations were made by M. Schmidt:—

Sept. 7	13 38 30·2	62 45 30·1	+ 1 47 18·0
8	15 52 25·4	63 4 29·1	+ 1 32 41·2

Solar Eclipse of January 31, 1851, *observed at Paramatta by Captain P. King, R.N., with Notices of other Observations of the Eclipse in Australia.*

This eclipse was observed at Newlands, Paramatta, by Captain King, in conjunction with the Rev. W. B. Clarke, whose account is given in vol. xi. p. 223. The northern limit passed almost exactly over Captain King's station, but most probably the annulus was not formed. On February 1st, the Paramatta date of the eclipse, the sky became clear after a longish series of indifferent weather. The telescope used was a refractor by Watkins and Hill, of $2\frac{3}{4}$ inches aperture and 44 inches focus, mounted equatoreally, the eye-piece *direct* and magnifying about 40 times.

First contact, $4^h\ 6^m\ 6^s$, Local M.T., within 3^s or 4^s.

When the eclipse approached its maximum phase, "The sky and terrestrial objects around were enveloped in a gloom of dull greenish hue, the moon's disc formed a huge black orbicular mass, suspended within a crescent of dazzling splendour,* while its lower edge seemed to be ploughing through a sea of fused metal. The cusps, which were attenuated to so acute an angle as to be scarcely definable, were so near each other and so rapidly approaching as

	′	″	
* Diameter of sun	32	29·8	Probably *tabular* diameters.
— moon	29	40·5	

Captain King states the smallest breadth of the uneclipsed portion of the sun to be 3′ 6″·7, but not whether this was *measured* or *computed*, probably the latter.

to be apparently on the point of meeting, when suddenly the interval was filled by a *thread* of pale white colour, and their forward motion stopped. This appearance only lasted 3^s or 4^s, when the thread disappeared, subdued by the rapid increase of returning light, as the cusps receded from each other in the progress of the eclipse; for they separated from each other as rapidly as they had previously approached." . . . . "The junction, however, between the thread and the cusps was not quite complete; for immediately contiguous to the latter, their glare subdued the pale light of the *thread*, and beyond this small space, the darkened sky behind contrasted with it, and assisted to make it, to me at least, prominent and distinct, especially as the atmosphere on the horizon had become extremely clear." Captain King conceives that the annulus was never quite formed, but that the edge of the moon, enlightened from behind, filled up the gap with the *thread*.

"During the time when the cusps were so rapidly advancing and receding with respect to each other, the appearances known as Baily's *beads* were visible in their angles for some time. They resembled bubbles protruding from, and again dissolving in, the dark edge of the moon's limb; and at one time a black band appeared in a longitudinal direction, bisecting the angle of one of the cusps." Captain King refers to Mr. Clarke's account, the substance of which is given, vol. xi. pp. 224, 225. At the same place will be found the meteorological observations made by Mr. Clarke. The numerous spots on the sun were carefully measured by Captain King (a well-executed drawing accompanies the paper), and he noted the times when these spots were covered by the moon's limb; but as no corresponding observations were made, these observations are not given.

Last contact, $6^h\ 31^m\ 35^s$, Local M.T.

At Newlands, the place of Captain King's observations, the Paramatta Observatory bears N. 88° 50′ W. (true); distance, 6189 feet; which, with compression $= \frac{1}{304}$, makes Newlands $1''{\cdot}2$ S., and $4^s{\cdot}89$ E. from Paramatta. Hence, using the position of Paramatta in the *Nautical Almanac*,

Newlands is in lat. 33° 48′ 51″ S.; long. $10^h\ 4^m\ 11^s$ E.

Observations at Melbourne; *Province*, Port Phillip.*

Latitude 37° 49′ S.; longitude $9^h\ 39^m\ 50^s$ E.

Mr. Latrobe, the lieutenant-governor of the province, kindly undertook to have the eclipse observed at Melbourne, which was nearly on the central line. Mr. Latrobe says, "The character of the light and its effect on the shadows were remarkable, but not easy to describe. The shadow of the stems of trees appeared streaky, and ill-defined on one side; that of leaves seemed surrounded by halos. The barometer was uninfluenced; the thermometer fell 5°, and afterwards rose 3°."

* This name is to be changed to Victoria.

Observations at Melbourne, by MM. Grover and Robertson.

1851.		h	m	s	
Feb. 1	First external contact	3	27	56	Melbourne M.T.
	— internal —	4	47	44	— —
	Last — —	4	52	48	— —
	— external —	6	2	3	— —

Observations at Sydney, *by* Mr. A. Longmore.

Latitude 33° 53′ 30″ S.; longitude $10^h\ 5^m\ 26^s$ E.

1851.		h	m	s	
Feb. 1	First contact	4	7	44	Sydney M.T.
	Last —	6	32	58	— —

Observations at Yarrowlumla, *by* Mr. Murray.

Latitude 35° 19′ S.; longitude 149° E.

The following is the substance of Mr. Murray's account:— "The annularity was decided here. We were evidently considerably within its northern limit, as the annularity lasted exactly 3^m. The disc of the moon appeared streaked by five stationary lines; its surface appeared rough. There was a slight glow of light over its dark face, on the upper part; its edges were uneven all round, but presented no striking irregularities. When the moon had passed over about a third of the sun, a deep crimson glow seemed to pass over his face, extended to the upper cusp, and then disappeared. On three occasions the cusps of the sun seemed blunted; but perhaps a little fatigue of the eye may account for all these appearances."

"At the commencement of the eclipse the thermometer in the shade stood at 82°, and, when exposed to the sun, at 93°. It fell during the annular phase to 77°, and by the end of the eclipse had risen to 86°."

Using Mr. Woolhouse's formulæ and the data of the *Nautical Almanac*,* Captain King has computed the following longitudes:—

		h	m	s	
Paramatta	By beginning	10	4	14·3	East.
	— end	10	3	58·3	—
Melbourne	By beginning	9	39	52·6	East.
	— end	9	39	54·1	—

On the Determination of Elliptic Orbits. By M. Benjamin Valz.

In the *Connaissance des Temps* of 1835, the author gave a method for calculating directly the orbits of comets, sufficient for obtaining the first approximation to the elements, to be rectified afterwards

* It must not be forgotten that the data of the *Nautical Almanac* can only be relied upon within the limits of accuracy of the Solar and Lunar Tables, which are as yet far from perfection.

by the calculation of the interval of time. It remained for him then to apply the same method to the determination of elliptic orbits, the number of which is constantly increasing, both by the discovery of additional small planets and comets of short period.

M. Valz takes the opportunity to clear up an historical difficulty relative to the first methods employed in the calculation of the orbits of comets, and to give some proof of what he had advanced in the preceding memoir, viz. that Bradley appears to have employed in his calculations the same steps, followed by Lacaille afterwards, without any other modification than some differences in the mode of computation.

He cites several passages from Delambre's *Astronomy of the Eighteenth Century*, and endeavours to prove that the latter has inadvertently misrepresented, in some degree, the methods of Lemonnier, which, when properly understood, tend to prove the author's views respecting Bradley's methods.

M. Valz then proceeds to explain his method of computing elliptic orbits, referring for the basis of the method to the memoir in the *Connaissance des Temps*. He gives formulæ by means of which, with the assistance of a table appended to the memoir, the true distance of the planet or comet from the earth can be computed; he then gives formulæ for computing the values of the radii-vectores, and the difference of the extreme anomalies: and, finally, for the computation of the elements of the orbit.

For more readily obtaining the excentric from the mean anomaly, he gives, for every 10° of excentric anomaly (x), a small table of the values of $\frac{\sin x}{\sin 1''}$; he adds also a table for determining the limits and extent of the double solution in the determinations of orbits.

Finally, he gives an example of the application of the method, with the computations in detail.

Extract of a Letter from Mr. Graham, of Mr. Cooper's Observatory, Markree Castle.

"A continued effort, during the past year, to determine the places of as many new stars as possible for insertion in our maps, and the consequent necessity for taking advantage of every favourable opportunity, in a climate where such seldom occurs, will account for our having done so little in the way of observing planets and comets. In the examination of comets especially, excellent as are our instrumental means, little can be done. Many, and among these some of the later ones, have escaped us altogether. Our observing nights commonly fail about 10 or 11 o'clock: we are hence obliged to begin our regular work as soon as it is dusk enough for our purpose. We have pursued our object steadily, and have, notwithstanding all the disadvantages of climate, been able to make some progress toward its accomplishment.

"With our proceedings up to the end of 1850 you are fully acquainted. The places of nearly 15,000 stars have, at the expense of the Government, been given to the public.* Situate in the most interesting zone of the heavens, and all, with an occasional exception, previously undetermined, it is hoped that this tribute to science will not be without its value. From the observations taken last year, we are able to make a gross addition of upwards of 12,000 stars. These are not all new, but the number of known stars included will not materially affect the total. The observations experience so many interruptions that the reductions nearly keep pace with them, and we shall soon be in a condition to arrange these stars also in a catalogue.

"Nearly all the stars known, from published catalogues or from our own observations, within the prescribed limits, have been inserted in maps, through 9 hours of right ascension. Each map embraces 8° in right ascension, and as much in declination. Their scale is four times larger than that of the Berlin maps, that is to say, nearly two inches to a degree. All the stars can thus be inserted without presenting a crowded appearance, and their magnitudes to the 12th distinctly exhibited. The epoch is 1850·0. The labour of reducing the stars of Bessel, Lalande, &c., up to this epoch, which is done with all requisite regard to accuracy, is by no means light.

"We are well aware that, in adopting this course, we are labouring for the future advantage of other astronomers rather than for greatly facilitating our own researches. To keep up anything like a constant survey of the heavens where, for weeks together, neither sun nor star is visible, is out of the question.

"I should mention that arrangements are made whereby, it is hoped, our contributions to your valuable *Notices* during this year shall be more regular. Mr. Cooper, with his wonted munificence, has had an eye-piece executed for the large equatoreal, which promises to be of considerable advantage in extra-meridional observations. With a considerably higher power than we have ordinarily used, it gives a larger and flatter field, and a very sharp definition. An adapter for the examination of solar maculæ has lately been applied by Mr. Cooper to his telescope. It is furnished with a drum of 9 inches diameter, containing alum water between parallel glasses. With the aid of this appendage, Mr. Cooper observed the late solar eclipse, using the whole aperture of the telescope, having no further defence than a pair of dark spectacles.

"In addition to the valuable personal assistance afforded by Mr. Cooper, as well in superintending the operations as in actually observing and preparing the stars for the catalogue, he has nearly concluded the transcription of his notes on comets for the printer. His catalogue of cometic orbits, containing upwards of 200 appa-

* Catalogue of Stars near the Ecliptic, observed at Markree during the years 1848, 9, 50, and whose places are supposed to be hitherto unpublished. Vol. i. containing 14,888 stars. Printed at the expense of her Majesty's Government, on the recommendation of the Royal Society, Dublin, 1851.

ritions, with notes, is now ready for publication. This work not only contains a complete list of the best orbits of all the comets which have been computed, but also extensive notes relative to the physical phenomena, &c. which have been remarked in these bodies, along with copious references; it will thus be a complete manual of what is known on the subject up to the present time. I allude to these facts to show that it is not merely for the large pecuniary outlay which such an institution involves that astronomy is indebted to Mr. Cooper, but, in addition, for his personal and unwearied exertions."

On the Longitude of the Observatory of Durham, as found by Chronometric Comparisons in the Year 1851. By Mr. R. C. Carrington.

When the observatory was first established, in the year 1841, its approximate longitude was found by trigonometrical measurement of its distance west from the cathedral, as given in a general survey; and $6^m\ 18^s$ west, neglecting portions of a second, was adopted to start with: this value appears in the *Nautical Almanac*. By observations of the moon and moon-culminating stars in the years that followed, it was found that $6^m\ 19^s$ was nearer to the truth, but there still remained an uncertainty of more than half a second. At the last meeting of the Observatory Syndicate, in the year 1850, it was decided that a determination by chronometric comparison should be forthwith obtained. The Astronomer Royal was written to, and granted his permission for the necessary access to the transit-instrument at Greenwich; and application was made to Messrs. Reid, of Newcastle, for the chronometers. Six were sent, three pocket and three marine box-chronometers: the latter only were found, on trial, to be suitable for the purpose. They were received on Jan. 4, 1851, and rated daily till the 17th by comparison with the transit-clock. The first up-journey was made on the night of Jan. 17, the first down-journey on the 27th, by railway, the chronometers lying, in the interval, in the chronometer-room of the Royal Observatory, and rated daily along with those on trial for the Admiralty. I secured a sufficient number of clock-stars before leaving Durham, on arrival at Greenwich, before departure, and after arrival on the return; so that the first journey was rendered independent of personal equation. The second journey up was made by night mail-train on Feb. 4. I arrived at Greenwich on the 5th, at $2^h\ 1^m$, and returned to Durham the same night, the state of the sky at Greenwich giving no hopes of obtaining observations for clock-error. Transits were obtained at Durham on the 4th, before departure, and on the 6th, after return; so that the second journey is affected only by a slight uncertainty in the assumed rate of the transit-clock at Greenwich, and in the personal equation applied.

My personal equation was determined by the transit-observa-

tions taken at Greenwich on Jan. 18 and 27, and is, as expressed in the Preface to the *Greenwich Observations*,

Dunkin — Carrington = + $0^{s}\cdot10$.

In the reduction it has not been attempted to determine travelling rates: it has been assumed that the vibration of the journeys caused equal deviations from the stationary rates of the time. The effect on the result, on this assumption, disappears in the mean of one up and one down-journey of the same chronometer. For the first journey two rates were employed, one for the up, another for the down-journey; for the second, one rate was found to be sufficient. These stationary rates were adopted from those immediately preceding and following the times of travelling. To the individual results weights were applied, inversely proportioned to the irregularities of rate of each chronometer, as follows:—

First Journey, by Hornby...	771	West	$6^{m}\ 20^{s}\cdot16$	Weight 1
— — — Reid	1109	—	$19^{s}\cdot70$	— 5
— — — Harrison	476	—	$19^{s}\cdot84$	— 1
	Mean,	West	$6\ 19^{s}\cdot79$	
Second Journey, by Hornby...	771	West	$6^{m}\ 19^{s}\cdot63$	Weight 1
— — — Reid	1109	—	$19^{s}\cdot71$	— 2
— — — Harrison	476	—	$19^{s}\cdot78$	— 2
	Mean,	West	$6\ 19^{s}\cdot72$	

The two results are considered to be of equal value, and

$6^{m}\ 19^{s}\cdot75$ West

is received as the final result, by chronometric comparison, for the longitude of Durham Observatory.

The three chronometers travelled in a deal box, well padded with horse-hair stuffing, made sufficiently low to go under the seat of a first-class railway carriage. The box rested steadily on three padded feet, and was carried between two men to and from all carriages. The chronometers were clamped in their gimbals while travelling, and appear to have been wonderfully little affected by the vibration they were subjected to. The calculations are preserved at full length at the observatory.

The communication of the result has been delayed since March 1851, in expectation of our being able to compare it with the geodetic longitude determined by the Ordnance Survey, but that result has not yet reached us.

P.S. Brorsen's Fifth Comet was carefully sought here on at least six different nights, but without success.

An Account of the Transit Circle at Mr. Drew's Observatory, Southampton, and of the Adjustments applied to it and to the Equatoreal. By Mr. Drew.

This transit circle is by Mr. Thomas Jones, and was made fifteen years ago. The telescope has $3\frac{1}{4}$ inches aperture, and $3\frac{1}{2}$ feet

focus; it will show the companion of *Polaris* in a dark field. The axis is 30 inches long, the Ys rest on stone piers, and the three microscopes for reading the divisions are fixed on a stone triangle at 120° from each other.

The telescope has five fixed transit wires, and one horizontal wire for north polar distance. This last is carried by a micrometer.

As the observatory is small and the instrument heavy (weighing about $1\frac{1}{2}$ cwt.), and as, from the arrangement of the microscopes, the reversal of the instrument would be inconvenient and dangerous, Mr. Drew has not attempted that operation. He thinks there may be some doubt as to the advantage of reversal in heavy instruments.

A collimating telescope of 1·6 inches aperture and 20 inches focal length is placed on a solid brick pier to the north, and outside the observatory, so as to be in the same line with the transit telescope, when horizontal. Mr. Drew does not find this much to be relied on as a *permanent* point of reference; but it is of great use for adjusting the instrument, considered as a well-defined mark. This collimator has a cover to protect it from the weather; and by opening a slide in front, and turning back the shutter behind to an angle of 45° (the shutter being whitened), distinct vision of the cross wires is obtained by day. At night the wires are illuminated.

To place the transit wires at right angles with the axis, it is sufficient to make the centre wire, through its whole length, pass over the cross of the collimator.

The intervals of the wires were determined by measuring them by the telescope and micrometer of the equatoreal (dismounted for that purpose), and also by transits of δ *Ursæ Minoris*. Mr. Drew gives a preference to the former method, which may admit of some question; but the two methods agree so fairly, that neither can be sensibly in error. The middle wire and the mean of the wires do not differ more than $0''{\cdot}5$.

In determining the error of collimation Mr. Drew has had more difficulty, and has not as yet been quite successful. He attempted to apply Bessel's method, viz., by taking out the object-glass and eye-piece of the transit telescope, and placing a telescope to the south of the instrument, in the same line with the collimator, so that the two are reciprocally collimators to each other. These being adjusted, and the object-glass and eye-piece inserted in the transit telescope — if the centre wire of the transit be made to bisect the wires of both the collimators, the collimation error is destroyed. From some want of steadiness in the position of the southern telescope, the attempt did not succeed; but Mr. Drew observes that this would be worth a trial with both telescopes on fixed piers.*

There are two ways of ascertaining the horizontality of the transit axis: first, by applying the level in the usual manner, which

* As in the Greenwich transit circle.

implies, however, that the pivots are equal; and secondly, by observing the coincidence of the central transit wire with its image seen in a mercurial horizon,* which also implies that the error of collimation is destroyed. Though the errors follow different laws, it would not be easy to separate them, very nicely, by observation. It is not probable that in a carefully-made instrument the difference of the pivots should be large, as the grinders ought to be used alternately for each; but without reversal, or without two collimators, it does not seem practicable to assign the relative errors correctly by the means adopted, unless the equality of the pivots can be assumed.† Mr. Drew has applied his level, and observed the coincidence of the transit wire with the image; the collimation, therefore, must correspond to the difference of the radii of the pivots, and cannot well be large enough to affect the accuracy of ordinary observations.

The meridian error is deduced, as usual, by observations of the upper and lower culminations of *Polaris*, and by opposite culminations of δ *Ursæ Minoris* and *Cephei* 51 Hev.

A specimen of the clock-errors, deduced from standard stars at different north polar distances, shows that the time at Mr. Drew's observatory is obtained with great accuracy.

In using the transit circle as an instrument for determining north polar distances, Mr. Drew relies on the nadir point, as determined by the coincidence of the horizontal line and its image seen by reflexion. He speaks with great confidence of the steadiness and consistency of this determination. The latitude of his observatory, deduced in this way from 9 Greenwich stars, is 50° 54′ 34″·4 N., probable error 0″·42; while the latitude derived from a triangulation connecting his observatory with the Ordnance Map Office gives 50° 54′ 34″. (The longitude, derived in the same manner from the Map-Office data, is 1° 24′ 25″·8 W.‡)

Mr. Drew gives a brief account of the manner in which he has adjusted his equatoreal; as nearly, that is, as the instrumental readings enabled him.

The altitude of the polar axis, and the collimation of the telescope in polar distance, are corrected by observations of standard stars near the meridian, and in reversed positions of the instrument. The azimuth is set right by making the instrumental polar distances of standard stars six hours from the meridian§ agree with their tabular north polar distances.

The error of collimation in right ascension is obtained by observing the passage of stars near the equinoctial over the central

* Mr. Drew's instrument is provided with the proper eye-piece for this observation, and the means of illumination both by day and night.

† A guage might show the equality of the pivots, and *perhaps* measure their difference.

‡ The Ordnance Survey Longitudes, since a more correct figure of the earth has been adopted, seem to agree perfectly with the best astronomical data. See the "Memoir of the Astronomer Royal on the Longitude of Valentia," *Mem. Royal Ast. Soc.*, vol. xvi. p. 55.

§ Correcting, of course, for refraction, which is always supposed. Mr. Drew has given a formula for the effects of refraction, but it does not appear so convenient as that adopted in the Greenwich Observations.

transit wire, in reversed positions. A comparison of the intervals of the transits in the two positions with the difference of the readings of the hour-circle, gives the correction of the collimation; and if the stars are standard, and the error of the clock known, the correction of the verniers of the hour-circle may be deduced from the same observations. Finally, the squareness of the declination axis to the polar axis* is proved by ascertaining, whether stars which differ in polar distance give the same clock-error. By applying these precepts in order, Mr. Drew shows that he has been able to put his equatoreal into as perfect a state of adjustment as he has means for ascertaining its errors.

Letter from the Rev. Mr. Read respecting the Luminous Bodies seen on Sept. 4, 1850. (See *Monthly Notices*, vol. xi. p. 48.)

"At the suggestion of several eminent members of the Society, I beg again to call your attention to the account of the phenomenon of shooting stars, as seen by myself and my family, in the day time, on the 4th of September, 1850.

"My former communication, which appeared in the *Monthly Notice* of December 1850, was a very brief one, and was only intended to call forth the observations of others, had any such been made; and I omitted then, purposely, to append any attestation of those who witnessed it with me, or to state anything that might be unnecessary, in the hope that more full accounts might be furnished.

"I have, however, now laid before the Council such necessary attestations; and, in addition, offer a few such particulars as seem necessary to render my former communication more complete.

"I have myself been a diligent observer for about twenty-eight years, with instruments of a superior order; but I never witnessed any such appearance before.

"The occasion of my being in the way of seeing so remarkable a phenomenon was, that I had been engaged for several previous days, in succession, in observing with my equatoreal the planet *Mercury*, in order to ascertain how nearly I could trace his approach to the sun; and it was the first instant that I adjusted the instrument that I saw the appearance which I describe.

"I was, at first, filled with surprise, and endeavoured to account for what I saw by supposing that bodies were floating in the atmosphere; but nothing was visible to the naked eye, while the sky was perfectly cloudless and serene: the ceaseless passing of perfect spheres of light in uncountable numbers soon convinced me of the reality of the phenomenon, and I called in haste the various members of my family to witness it, which they did, with me, for many hours.

* Careful artists frequently make this adjustment themselves, and leave no power of alteration. When the polar axis is vertical, it is easy to make the declination axis horizontal; and when all the parts are sound and the work true, this adjustment is not likely to be altered. The application of a level is seldom convenient for a mounted equatoreal, but this adjustment may be performed by a level.

"The bodies we observed were all perfectly round, with about the brightness of *Venus*, as seen in the same field of view with them; and their light was white, or with a slight tinge of blue.

"The time they occupied in passing was, as nearly as I could estimate, about one-fourth of a second of time; but they showed no tail of light, such as seen in the case of shooting stars by night.

"They did not cease for a minute, passing often in inconceivable numbers, from the time I first saw them, viz. about half-past 9 A.M. to about half-past 3 P.M. when they became fewer, passed at longer intervals, and then finally ceased.

"There was nothing remarkable at night, that I saw; but having prepared the equatoreal on the following day, which was equally favourable for observation, I observed *one* body pass, precisely similar to the vast number we had observed the day previous.

"They occupied a zone, as nearly as I could judge, about 18° in breadth; and as both *Mercury* and *Venus* were visible by the telescope, I had an opportunity of comparing them with these planets; both of which presented a remarkable difference to the bodies crowding through the field of view.

"I expected that the appearance would be witnessed by many observers, and delayed for some days noticing the circumstance to any other astronomers; but not finding any remark on the subject in the newspapers, I then stated the occurrence to Mr. Hind, of the South Villa Observatory, who thought it of sufficient importance to be communicated to the Society.

"On comparing the phenomenon we witnessed with that observed at Boston, U.S. by Messrs. Olmsted and Palmer, as noticed by Capt. Smyth, in his *Cycle*, vol. i. p. 164, and by Baron Humboldt, *Cosmos*, vol. i. p. 112, there appears an entire similarity between them, with the exception of what we saw occurring in the day, while the phenomenon they witnessed was during the night.

"These gentlemen compared what they saw to flakes of falling snow, and nothing could better describe what we witnessed, allowance being made for the greater brilliancy of daylight, which diminished their intensity of lustre; but being seen upon the deep blue vault of heaven, they presented an appearance of beauty and interest never to be erased from the memory."*

Rule for the Signs of the Terms in the Equation of Equal Altitudes.
By Capt. Shadwell, R.N. F.R.A.S.

"An idea has recently occurred to me with reference to the formulæ for the 'Equation of Equal Altitudes,' which perhaps you may think worthy of notice.

"I have observed that many persons are at fault when called

* The remark appended by the Editor to Mr. Read's former letter is shown by the present Letter to be erroneous, and must be withdrawn. It is, perhaps, not impossible that even an experienced observer should have been misled by some cause which temporarily affected his vision; but the luminous bodies, seen by Mr. Read, being also seen repeatedly, and for hours, by two members of his own family accustomed to the use of the telescope, and also by a visitor, negative any such explanation.—*Ed. N.*

upon to recollect the signs of the corrections of the two parts of the 'Equation of Equal Altitudes;' and it has occurred to me that a convenient technical rule might be given, apparently independent of any mathematical condition whatever.

"Most of the writers on navigation express the rule in such terms as apparently to involve several distinctions of cases.

"The rule, as it is very clearly expressed in Riddle's *Navigation*, is as follows:—

"'The first part, that under log A, is + when the polar distance is increasing, and — when it is decreasing. And the second, that under log B, is — when the polar distance is acute and increasing, or obtuse and decreasing, and + when the polar distance is obtuse and increasing, or acute and decreasing.'

"A brief examination of these conditions will show that the following law prevails:—

"The sign of the first part is positive from the summer to the winter solstice, and negative from the winter to the summer solstice.

"And that of the second part, positive from the equinoxes to the solstices, and negative from the solstices to the equinoxes.

"The polar distance in Mr. Riddle's rule is supposed to be always measured from the elevated pole, and the above technical rule will hold equally good in both hemispheres, provided we agree to understand the terms summer and winter solstices in their *natural* sense, according to the actual seasons at the places of observation, and not in that technical sense which the monopoly of astronomical observation in the northern hemisphere has caused astronomers to attach to them.

"It will thus be observed, that the signs of the two parts of the equation can thus be expressed independently of any mathematical condition whatever, and may be viewed merely as simple functions of the seasons of the year."

Solar Spots.

Captain Shea, of the H.I.C.S. has presented the Society with a continuation of drawings of the solar spots during the past year. The drawings are in a book, in a very regular method, and easily referred to. There are drawings, too, of several phases of the late solar eclipse with the times annexed.

Capt. Shea seems to be of opinion that the spots are bodies *detached* from the sun, and thinks that this is supported by some of the phenomena witnessed during the late eclipse. This idea was, if we remember, satisfactorily refuted by Galileo, and certainly has since received no increase of evidence in its favour.

Mr. Joseph Turnbull, of Kentish Town, has presented to the Society a very full series of drawings of the sun from March 22 to October 2, 1851. They were observed with a refractor of $2\frac{1}{2}$ inches aperture, power 45. The scale is rather small.

London: Printed by G. Barclay, Castle St. Leicester Sq.